ESD and ATEX
in Material and Component Handling segment

Distributor webinar 20.06.2023

FUTURE TRENDS AND PHENOMENA

1. Corporate Responsibility
2. Real-time data
3. Services

Vision

Our first-class services and sustainable material innovations guarantee success for our customers and us

STRATEGIC GOALS

1. Best service company in our industry field
2. Enabling a smaller carbon footprint for our customers and their customers
3. Strong and sustainable growth

PURPOSE

Creating a safe society with functional materials

VALUES Appreciation Courage Passion

MARKERwizards

PREMIX

Webinar objectives

1. Refresh concepts of ESD and ATEX

2. Premix product **portfolio** for the ESD and ATEX applications in Materials and Component handling

Drivers for material handling segment

ESD: Electrostatic Discharge

Purpose: Protecting against unintentional electrostatic discharges

There are international standards for ESD protection

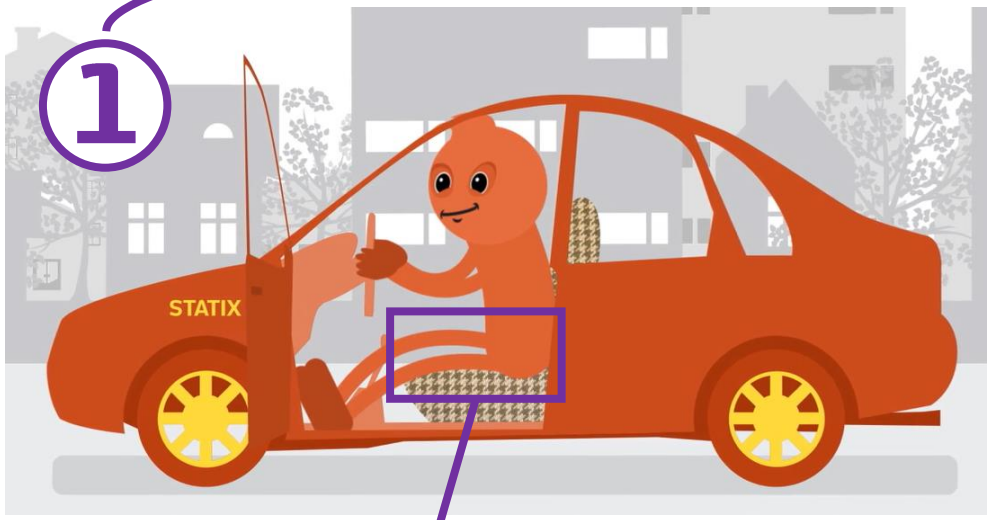
ATEX refers to ATmosphères Explosives (explosive atmospheres)

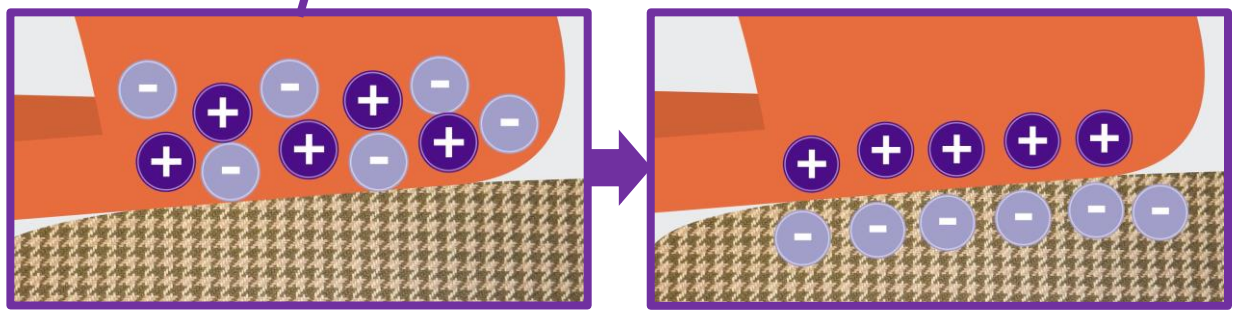
Purpose: Protecting against accidents in explosive (Ex) environments

ATEX is an EU directive.

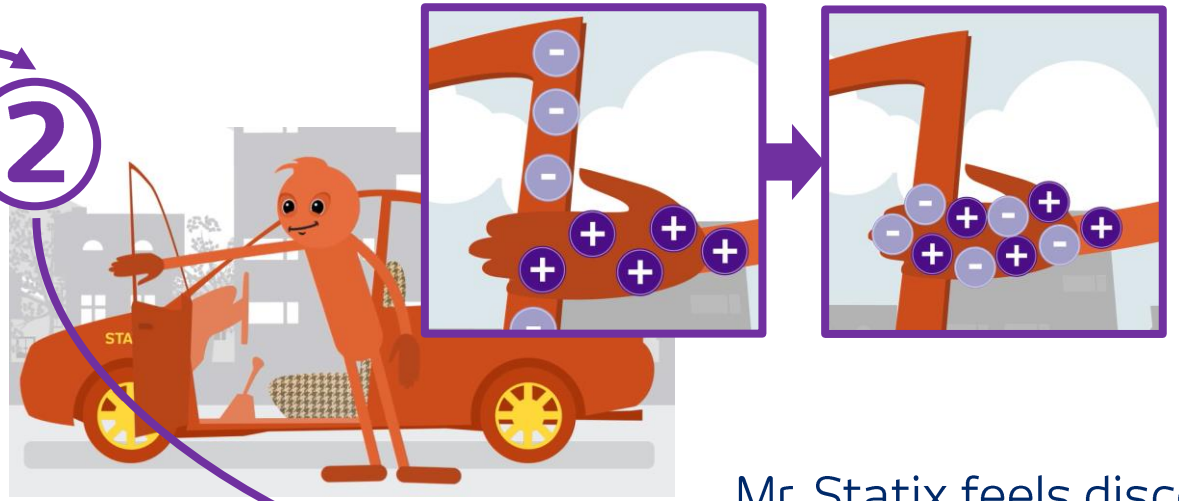
In addition, plastics' light weight, mass-production capabilities, economicality, and freedom of design bring a lot of value when selecting the source materials.

How is ESD created?





Mr. Statix's backside is rubbing the car seat. He becomes positively charged.



When he gets out of the car, he touches the door. His positive charge is discharged (ESD).

Mr. Statix feels discomfort.

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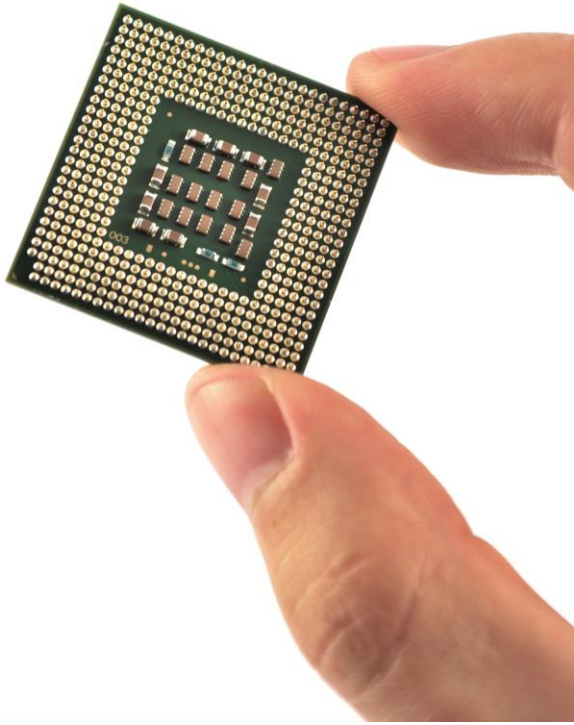
See the whole video at https://www.premixgroup.com/where-to-use/controlling-static-electricity/

ESD in electronics industry



A person or an object can be charged by

- Walking across the floor
- Pulling of a piece of tape
- An electronic device sliding into or out of a bag or other packaging

Discharge happens, when the charged person or object touches an object that is grounded.

You can not see, hear or feel ESD unless it has a potential of 2000-3000 Volts. But sensitive devices could be damaged by ESD with 100 V or less.

For an example of ESD Damage under electron microscope:
https://blog.item24.com/en/workbenches/identifying-esd-damage-using-an-electron-microscope/

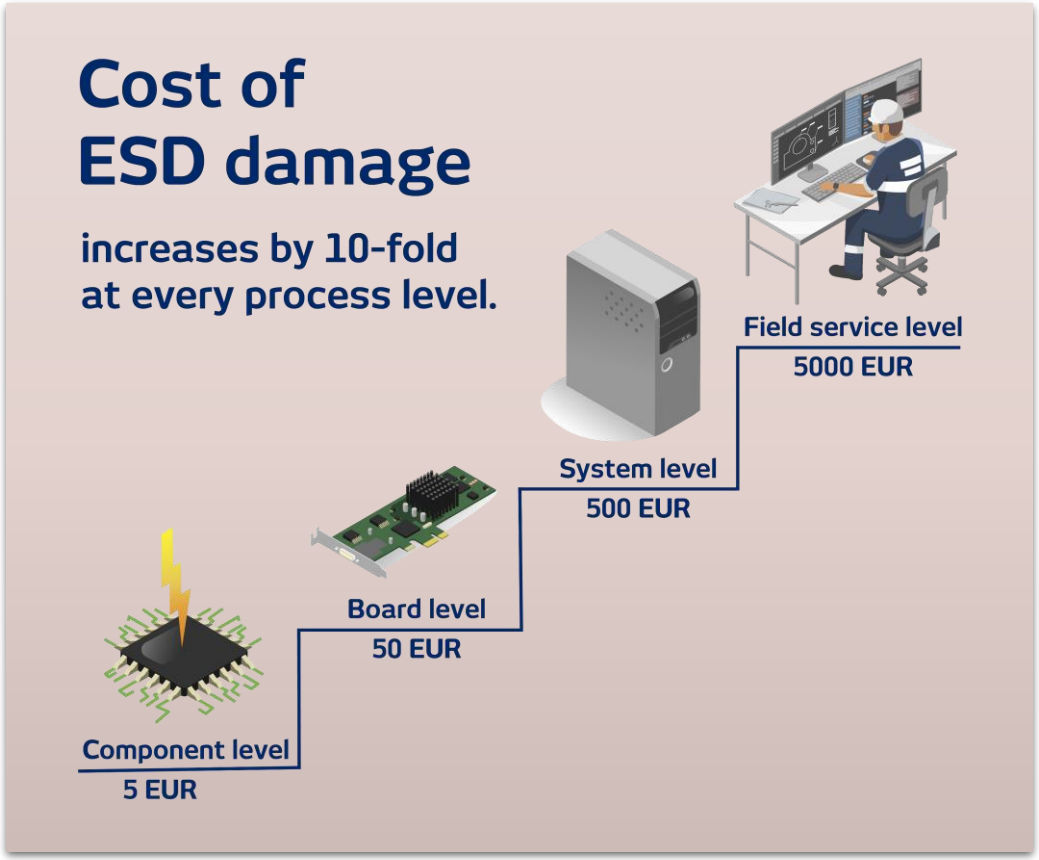
More information at https://www.esda.org/esd-overview/

ESD in electronics industry

ESD affects:

- Production yields
- Manufacturing costs
- Product quality and reliability

The cost of damaged devices ranges from only a few cents for a simple diode to thousands of dollars for complex integrated circuits (microchips).



More information at https://www.esda.org/esd-overview/

SOLUTION
Conductive compounds in electronics industry

Enclosures of electronic devices
- **Protection from ESD from environment**

Assembly stands, tools and working surfaces
- **Protection from ESD from humans**

In scope of Materials and Component Handling segment

Packaging of ESD sensitive devices
- **Protection from ESD from humans**
- **Protection from sliding in, moving out, and movements during transportation**

IEC 61340-5-3:2015 – international standard that provides clearly the surface resistance requirements for different applications.

ATEX

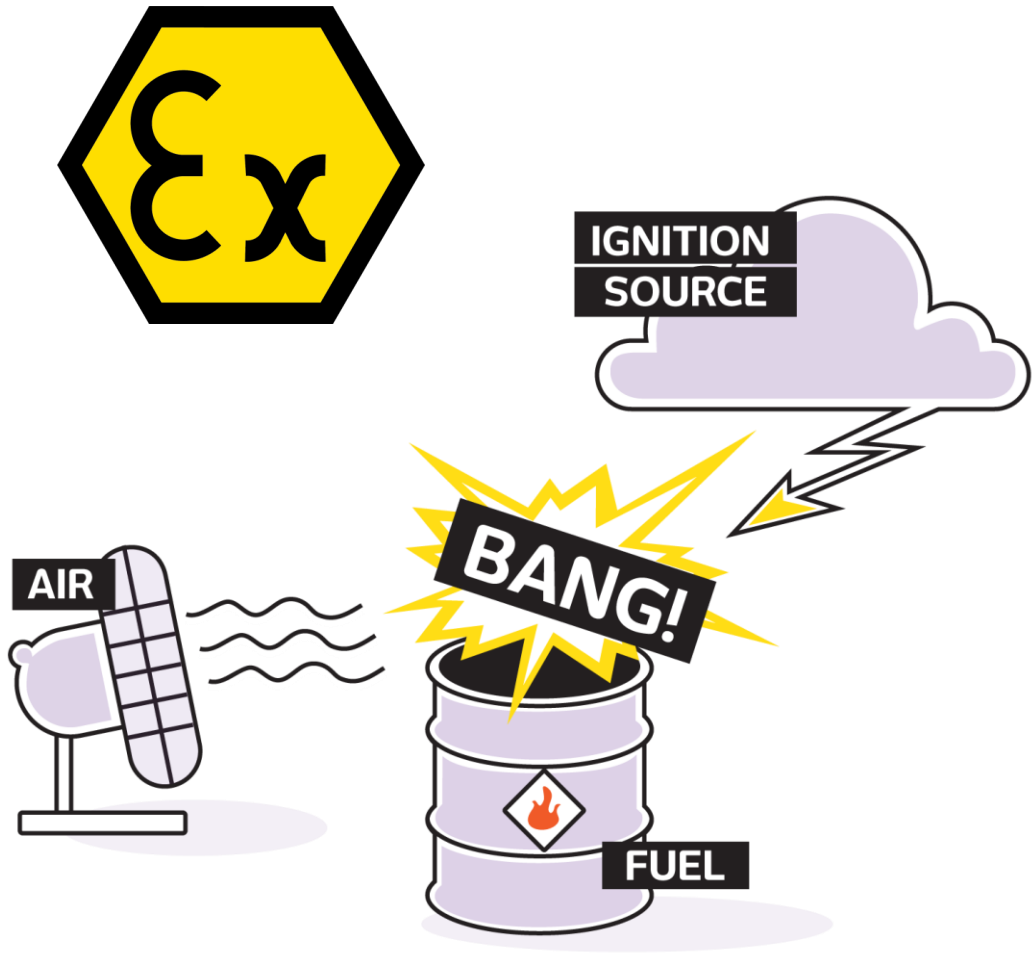
In explosive (Ex) environments, electric sparks are especially dangerous

Explosions can occur when these factors combine

- Dry air
- Explosive substances in the air, such as
  - Oil fumes, gasses
  - Dust, e.g., sawdust
  - Baking flour, etc.
- Ignition source (e.g., ESD)

European Union's ATEX Directive (2014/34/EU)

- Covers equipment and protective systems intended for use in potentially explosive atmospheres
- NOT a directive for raw materials, but defines
  - Resistance generically needs to be under 1 giga-ohm, in some conditions even lower
  - There can be certain temperature limits



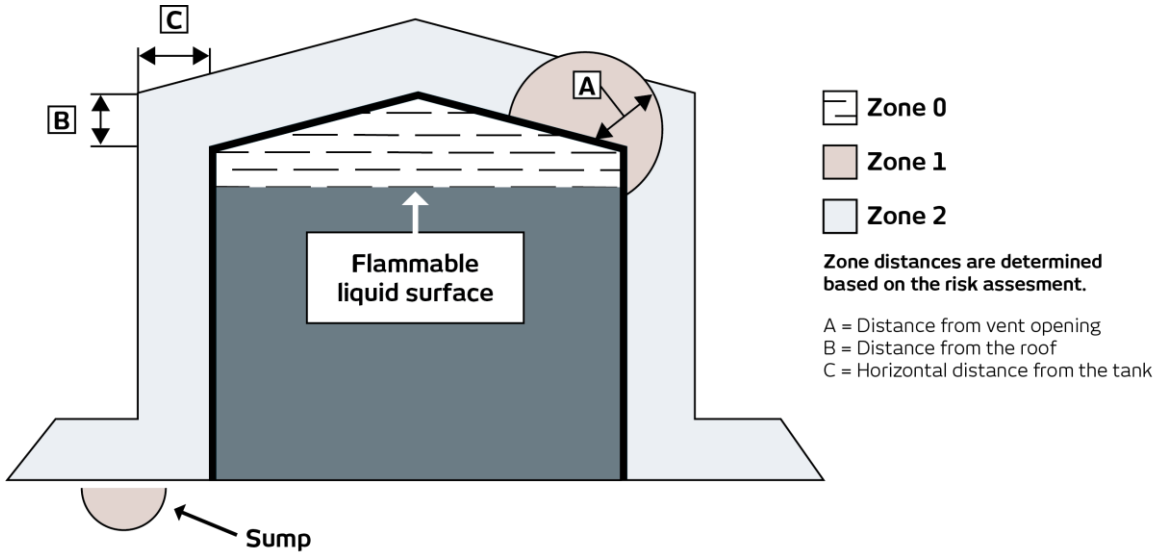
More information at https://single-market-economy.ec.europa.eu/sectors/mechanical-engineering/equipment-potentially-explosive-atmospheres-atex_en

Examples of ATEX environments

Fatal hydrogen explosion at a power plant in Muskingum, Ohio, United States, 2007
https://wha-international.com/case-study-power-plant-hydrogen-explosion/

The Great Mill Disaster (also known as the Washburn A Mill explosion) in Minneapolis, Minnesota, United States, in 1878
https://en.wikipedia.org/wiki/Great_Mill_Disaster

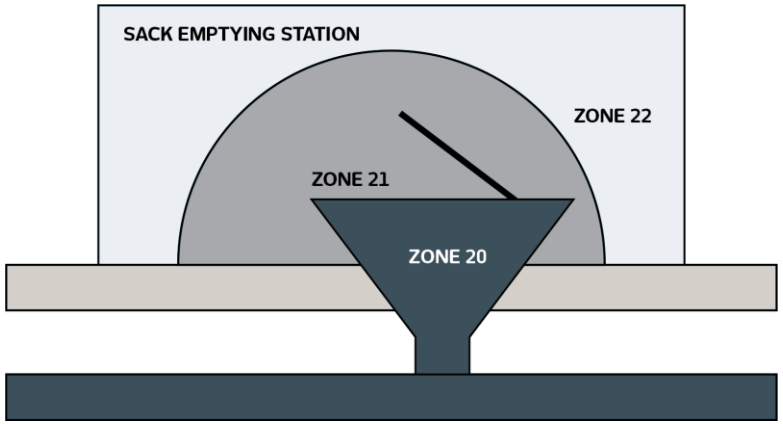
Examples of ATEX environments

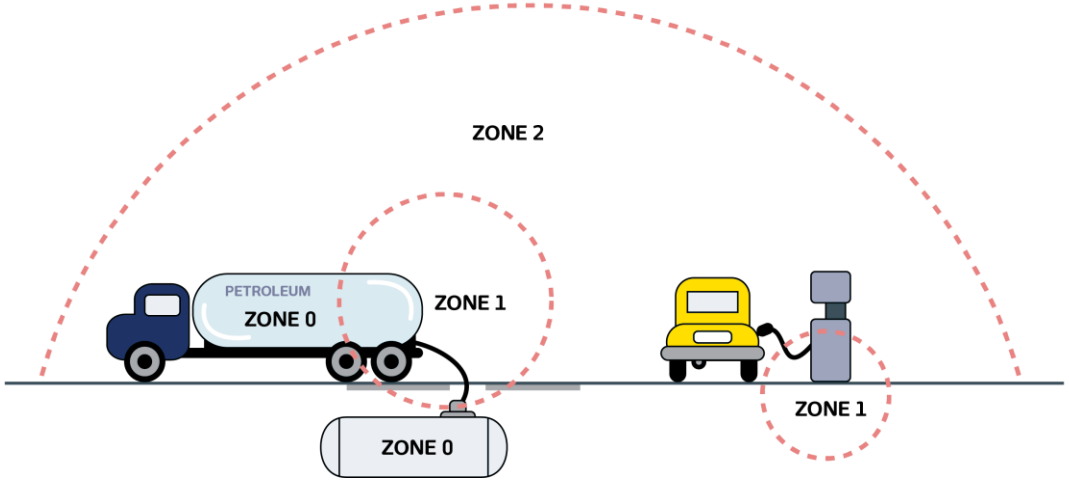


Zone 0
Zone 1
Zone 2

Zone distances are determined based on the risk assesment.

A = Distance from vent opening
B = Distance from the roof
C = Horizontal distance from the tank





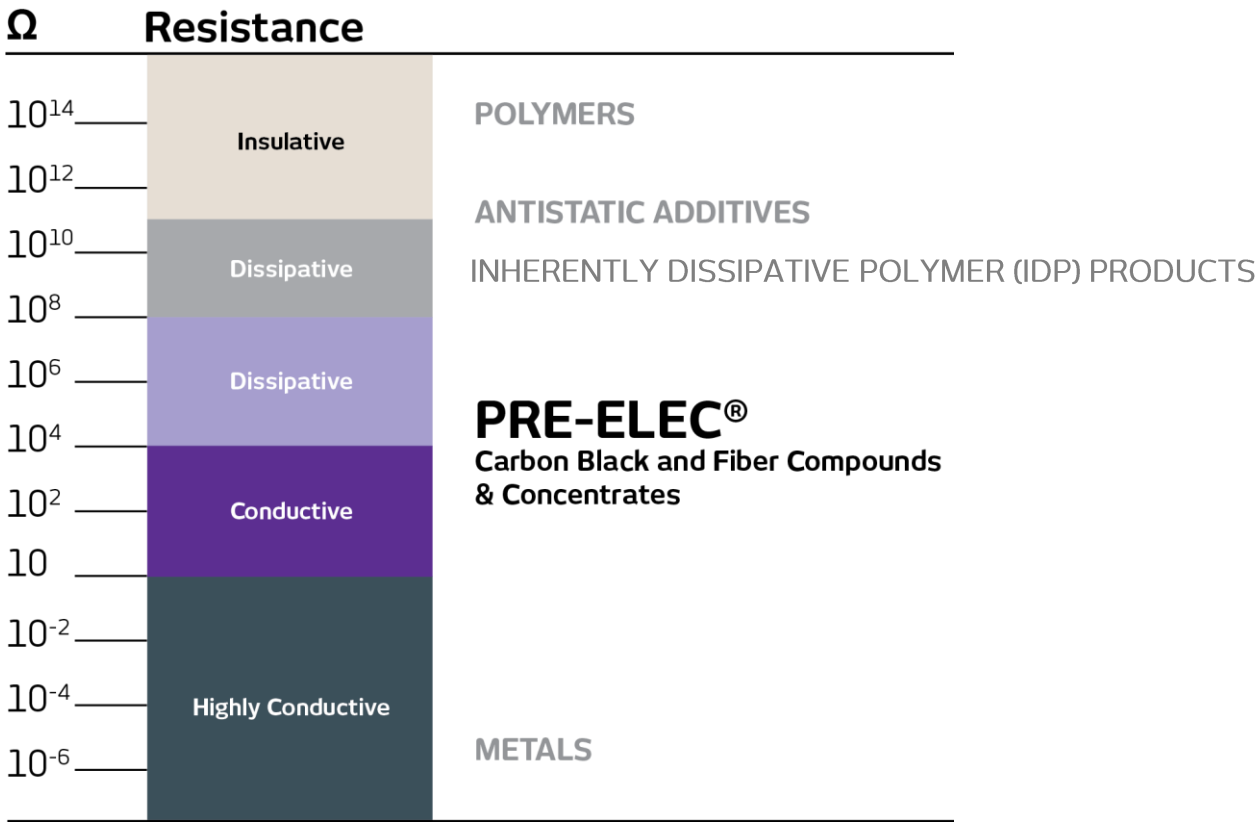
Atex Zone: a place in which an explosive atmosphere is	Gases	Dusts
continually present	0	20
likely to occur in normal operation occasionally	1	21
not likely to occur in normal operation and only for very short durations	2	22

PRE-ELEC® GRADES

for ESD and ATEX applications
in Materials and Components Handling Segment

PREMIX

Resistance spectrum of PRE-ELEC® grades



ESD materials – corrugated sheets

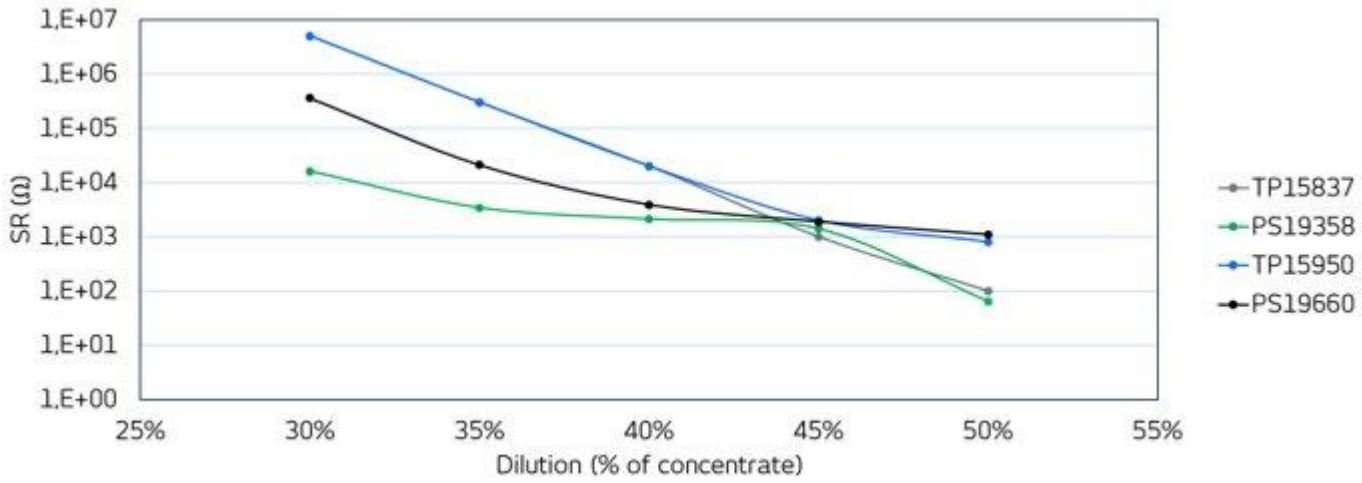
	PRE-ELEC® Grade	More info
Concentrates	PP 19279	• economic • contains CaCO3 thus higher density
	PP 15392	• requires more efforts to be homogenized, • longer screw is needed/L/D ratio <30 • pricewise medium
	PP 1393	• easy to homogenize • excellent surface • pricewise expensive
	PP 19625 (NEW)	• technically easy to homogenize & economically competitive • a product technically reminding PP 1393
Compounds	PP 1397	• extremely rarely used by the industry nowadays • concentrates are preferred

Competitors: Polyplast Mueller, RTP (who else is known?)

ESD materials – PS thermoformed trays

	PRE-ELEC® Grade	More info
Concentrates	TP 15837	
	PS 19358 (NEW)	• very conductive • uneven surface as contains recycled material • can be diluted only with virgin PS
	PS 19660 (NEW)	• equivalent of TP 15837, but with higher conductivity & lower costs

Competitors: Cabot



ESD/ATEX materials – special films, yarn and filaments

	PRE-ELEC® Grade	More info
Concentrates	PE 17840	• PE-LLD based • cast film or yarn and filaments, e.g., for FIBC type C
	PP1353	• PP based • Filament for FIBC type C
Compounds	PE 1271	• PE-LD/PE-LLD based • blow extrusion & cast • multi-& monolayer films • best mechanical properties
	PE 18381	• PE-LD based • blow & cast • multi-& monolayer films
	PP 16156	• cast film • due to high conductivity can be also diluted

Competitors: Ampacet, Cabot, Eurotec

ESD/ATEX pallets & boxes

	PRE-ELEC® Grade	More info
Concentrates	PP 17575	• injection moulding
	PP 18999	• injection moulding • economical
	PE 18594 (NEW)	• PE-HD based • extrusion • foldable containers
Compounds	PP 19599 (NEW)	• medium mechanical properties • high MFI • easy to process
	PP 19161	• superior mechanical properties • lower MFI • demands more skills to mould
	PP 19136	• dissipative
	PS 18014	• replacement for PS1335 with higher MFI and conductivity
	PS 1328	• lower MFI , but higher TS vs PS18014

Competitors: Eurotec, Ravago, Cabot, Ampacet, Hubron

ATEX materials – canisters, bottles, pails

	PRE-ELEC® Grade	More info
Concentrates	PE 1296	• PE-HD based • blow molding mono-& multilayer • excellent mechanical properties even for drums 200 lt
Compounds	PE 1291	• PE-HD based

Competitors: LyondellBasell, Cabot

ESD/ATEX materials – sheets

Concentrates

PRE-ELEC® Grade	More info
PE 1296	• PE-HD based • highly conductive • premium product
PE 1250	• PE-HD based • premium -
PE 18594 (NEW)	• PE-HD based • economical grade • less conductive
PE 17840	• PE-LLD based • can be blend with all PE & even with ABS+EPDM

Compounds

PRE-ELEC® Grade	More info
PE 1291	• PE-HD based • better mechanical properties vs PE 1292
TP 11270	• PE-HD based • easy welding • low fuel permittivity
TPU 1512	• polyester • co-ex with ABS
TPU 18025	• polyether • designed for calendaring
ABS 1415	• co-ex with TPU
PC/ABS 1420	

ESD materials – foams

Our target customer for PE foam:

- 2- step production foam: extrusion followed by foaming and cross-linking, not direct foaming by gases due to mechanical weakness of that foam;
- Chemical blowing by, e.g., AZD (azo-& diazo compounds);
- Cross-linking chemical by peroxides or physical by radiation;
- Continuous or batch molding foam;
- Base polymer: PE-LD, EVA

	PRE-ELEC® Grade	More info
Concentrates	CP 1515	• EVA based
	PE 17800	• PE-LD based, no antioxidant

Competitors: Cabot

Next webinars (2H/2023)

Processing PRE-ELEC® compounds and concentrates (injection molding and extrusion)

Sustainability at Premix

Materials for Healthcare segment

What else, dear Distributors!

LET'S MAKE
A GOOD MIX

www.premixgroup.com